

60 to 120 mg of the hydrochloride in 2 divided doses. Ambroxol has also been given by inhalation, injection, or rectally.

Adverse effects. **HYPERSENSITIVITY.** A report¹ of contact allergy to ambroxol, but not bromhexine.

1. Mancuso G, Berdondini RM. Contact allergy to ambroxol. *Contact Dermatitis* 1989; **20**: 154.

Pharmacokinetics. References to pharmacokinetic studies of ambroxol.

1. Hammer R, *et al.* Speziesvergleich in Pharmakokinetik und Metabolismus von NA 872 Cl Ambroxol bei Ratte, Kaninchen, Hund und Mensch. *Arzneimittelforschung* 1978; **28**: 899-903.
2. Jauch R, *et al.* Ambroxol, Untersuchungen zum Stoffwechsel beim Menschen und zum quantitativen Nachweis in biologischen Proben. *Arzneimittelforschung* 1978; **28**: 904-11.
3. Vergin H, *et al.* Untersuchungen zur Pharmakokinetik und Bioäquivalenz unterschiedlicher Darreichungsformen von Ambroxol. *Arzneimittelforschung* 1985; **35**: 1591-5.

Respiratory disorders. Mixed results¹⁻³ were obtained when ambroxol was used in chronic bronchitis or chronic obstructive pulmonary disease (COPD—p.1112); in a randomised study, it was no better than placebo in preventing acute exacerbations of COPD; however, in a subset of patients with more severe disease, ambroxol therapy reduced the number of exacerbations.⁴ It was ineffective⁵ when given to mothers for the prophylaxis of neonatal respiratory distress syndrome (p.1508), although it may be of modest benefit in the early treatment of established disease in infants.^{6,7}

Inhalation of ambroxol aerosol has also produced beneficial effects in a patient with alveolar proteinosis who refused alveolar lavage.⁸

For the use of mucolytics in productive cough see p.1547.

1. Olivieri D, *et al.* Ambroxol for the prevention of chronic exacerbations: long-term multicenter trial: protective effect of ambroxol against winter semester exacerbations: a double-blind study versus placebo. *Respiration* 1987; **51** (suppl 1): 42-51.
2. Guyatt GH, *et al.* A controlled trial of ambroxol in chronic bronchitis. *Chest* 1987; **92**: 618-20.
3. Alcozer G, *et al.* Prevention of chronic bronchitis exacerbations with ambroxol (Mucosolvan Retard): an open, long-term, multicenter study in 5,635 patients. *Respiration* 1989; **55** (suppl 1): 84-96.
4. Malerba M, *et al.* Effect of twelve-months therapy with oral ambroxol in preventing exacerbations in patients with COPD: double-blind, randomized, multicenter, placebo-controlled study (the AMETHIST Trial). *Pulm Pharmacol Ther* 2004; **17**: 27-34.
5. Dani C, *et al.* Antenatal ambroxol treatment does not prevent the respiratory distress syndrome in premature infants. *Eur J Pediatr* 1997; **156**: 392-3.
6. Wauer RR, *et al.* Randomized double blind trial of Ambroxol for the treatment of respiratory distress syndrome. *Eur J Pediatr* 1992; **151**: 357-63.
7. Schmalisch G, *et al.* Changes in pulmonary function in preterm infants recovering from RDS following early treatment with ambroxol: results of a randomized trial. *Pediatr Pulmonol* 1999; **27**: 104-12.
8. Diaz JP, *et al.* Response to surfactant activator (ambroxol) in alveolar proteinosis. *Lancet* 1984; **i**: 1023.

Uricosuric action. A study¹ was carried out in 48 young male healthy subjects to examine the uricosuric effect of ambroxol. The minimum effective dose for lowering plasma-uric acid concentrations was found to be between 250 and 500 mg daily given in 2 divided doses. Although these doses are much higher than those used to treat bronchopulmonary disease, doses as high as 1 g daily were well tolerated.

1. Oosterhuis B, *et al.* Dose-dependent uricosuric effect of ambroxol. *Eur J Clin Pharmacol* 1993; **44**: 237-41.

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Ambrit; Apracur Expectorante; Cortos; Graneodin Expectorante; Mucosolvan; Tabin Expectorante; Tavinex Expectorante; Tavinex Expectotabs; Tosambrex. **Austria:** Ambrobene; Ambrohexal; Ambrolan; Ambrolol; Ambronorm; Bisolangin; Bisolary; Broxol; Mucoangin; Mucosolvan; Sekretovit. **Belg.:** Mucoangin; Surbronc. **Braz.:** Ambrozil; Ambrol; Ambroten; Ambrox; Anabron; Broncoflux; Bronxol; Expectuss; Fluibron; Fluidin; Fluxol; Mucibron; Mucodeant; Mucolin; Mucosolvan; Mucoxolan; Neossolvan; Probec; Pulmosolvan; Surfactil. **Chile:** Bronchopront; Broncot; Fluibron; Fluomit; Milbron; Mintamox; Mucosolvan; Muxol; Tocalm; **Cz.:** Ambex; Ambrobene; Ambrosan; Ambrospray; Bronchopront; Dignobroxol; Dr Rentschler Hustenlöser; Fervec; Flavamed; Halixol; Mucosin; Mucosolan; Neo-Bronchol; Solvolan; **Denm.:** Mucoangin; **Fr.:** Lysopadol; Muxol; Surbronc. **Ger.:** Ambrit; Ambro; Ambro-Puren; Ambrobeta; Ambrodec; Ambrohexal; Ambroinflat; Ambrolol; Ambropp; Bronchopront; Bronchowerm; duramucal; Expit; frenopect; Frubizin akut; Larylin Husten-Löser Pastillen; Larylin Husten-Löser Saft; Linoxyl; Muco-Aspecton; Mucoangin; Mucobroxol; Mucophlogat; Mucosolvan; Neo-Bronchol; Padimuc; Pulmotin Hustenlöser; Sigabroxol; stas-Hustenlöser; tuss; **Gr.:** Ambrobion; Abrolen; Afrodor; Amboral; Ambrobion; Ambromy; Anavix; Aprinol; Auroxol; Bufanol; Celbron; Dolcevin; Ebertuss; Effercet; Erosil; Fluibrox; Grenovix; Hivotex; Kriolen; Lextarol; Mavixan; Mucolin; Mucosolvan; Mucovix; Nibren; Olbenorm; Proxiven-N; Puntol; Respirol; Saribal; Stefolan; Strubelin; Tevoril; Tosse; Tussefar; Zyrantol. **Hong Kong:** Amxol; Bronchopront; Marbroxol; Max; Medovent; Mucosolvan; Quali-solvan; **Hung.:** Ambrobene; Ambrohexal; Bronchopront; Halixol; Mucoangin; Solvolan; **India:** Accotrin; Acolyt; Ambrodi; Inhalax; **Indon.:** Ambrit; Brommer; Bronchopront; Broncozol; Broxol; Epexol; Extopect; Gunapect; Interpec; Lapimuc; Molapect; Mucera; Mucolica; Mucopect; Mucos; Mucolol; Nufanibrox; Silopect; Sohopen; Transbroncho; Transmucol; **Ital.:** Ambrotus; Ambrobron; Atus; Broxol; Fluibron; Fluxol; Lintos; Lisopulm; Mucilar; Mucosolvan; Mucobron; Mucosolvan; Secretil; Surfactil; Tauxol; Viscomucil; **Jpn.:** Mucosal; Mucosolvan; **Malaysia:** Amxol; Axol; Mucosolvan; Shinoxol; Strepsils Chesty Cough; **Mex.:** Ambrofr; Amocel; Axol; Balsbron; Bionoxol; Boxolan; Brogal; Bronolban; Brosolan; Broxaquim; Broxofar; Broxoffler; Broxol; Broxilim; Cloxan; Ebronim; Euroxol;

Exabrol; Expeffen; Fantrodol; Ital-Ultra; Loexom; Loxibron; Mucibron; Mucoangin; Mucosolvan; Mucovibrol; Mucovibrol T; Mucoviol; Musalten; Musvan; Muxol; Oxolvan; Prospect; Protitus; Randex; Rimoxol; Sekretovit; Septacin; Seraxol-S; Softxol; Solpat; Tobrin; Tradexol; Trimexin; Tunitol-BX; Tusibron; Ula-X; Vialox; Weisal; **Neth.:** Mucoangin; **Philipp.:** Ambrolol; Attrivex; Brocol; Bromace; Bromacef; Broxan; Broxifil; Broxil-M; Broxitol; Broxolan; Broxol; Expel; Medibron; Mepebrol; Mucosol; Mucosolvan; Mucovix; Phlemasol; Pontef; Pulmobrol; Venteez; Vioxol; Zobroxol; **Pol.:** Allegan; Amox; Ambrohexal; Ambroksol; Ambrosan; Ambrosol; Deflegmin; Flavamed; Mucoangin; Mucosolvan; Mucobron; Tussal Expectorans; **Port.:** Benflux; Bromax; Bronchopront; Broncolber; Bronxol; Drenoxol; Fluidox; Fluidrenol; Hipotosse; Mucodrenol; Mucosolvan; Mucotosse; **Rus.:** Ambrobene (Амбробене); Ambrohexal (Амброгексал); Ambrosan (Амбросан); Ambrosol (Амбросол); Bronchowerm (Бронхверм); Halixol (Халиксол); Lasolvan (Лазолван); Medovent (Медовент); Suprima-Kof (Суприма-Коф); **Singapore:** Amxol; Axol; Bronchopront; Max; Mucosolvan; Mucosolvan; **Spain:** Ambrolit; Dinobroxol; Motosol; Mucibron; Mucosan; Naxpa; **Swed.:** Mucoangin; **Switz.:** Fluibron; Mucabrox; Mucoangin; Mucosolvan; **Thai:** Ambrol; Ambrolit; Ambrolit; Ambrox; Ambroxan; Ampromed; Amtuss; Amxol; Bronchopront; Broncol; Broxol; Broxsa; Max; Medovent; Misovan; Movent; Mucodi; Mucolan; Mucolul; Mucomed; Mucopex; Mucosolvan; Mucosine-F; Mucosan; Muscan; Mucobrox; Polibroxol; Simusol; Strepsils Chesty Cough; Streptusol-C; **Türk.:** Ambreks; Fluibron; Mukoral; Pulmor; Sekrol; Tuslin; **UAE:** Mucum; **Venez.:** Ambrit; Ambromuco; Ambrox; Benflux; Brocantol; Bronchopront; Lituxix; Misulvan; Mucoangin; Mucoramat; Mucosolvan; Muxen; Xolvan.

Multi-ingredient. Arg.: Amoxi Respiratorio; Amoxidal Respiratorio; Amoxidal Respiratorio Duo; Amoxigrand Bronquial; Amoxipenil Bronquial; Amoxitenk Respiratorio; Aseptobron Respiratorio; Bronco Biotaer; Bronquisedan; Bronquisedan Mucolitico; Cefacar Mucolitico; Cefaclina Bronquial; Gentibron; Letondal; Muco Cortos; Muco Dosados; Muco Dosados Biotic; Mucoprednibron; Mucosolvan Compositum; No-Tos Biotic; Nobactam Bronquial; Oxibron NF; Oximar Respiratorio; Pulmonix Plus; Toraxan; Trexilor NF; Trifamox Bronquial Duo; **Austria:** Mucospas; **Braz.:** Penetro; **Chile:** Ambrotos; **Cz.:** Doxycyclin Al comp; **Ger.:** Ambroxol; Ambroxol Al comp; Ambroxol comp; Amox-Puren; Azudoxat comp; Broncho-Euphyllin; Doxam; Doximucol; Doxy Comp; Doxy Lindoxyl; Doxy Plus; Doxy-Wolff Mucolyt; Doxysolvat; Jenabroxol comp; Sigamuc; Spasmo-Mucosolvan; Terelit; **India:** Ambrodi Plus; Ambrodi-S; Amcof; Amcold; Asthalin AX; Axalin-AX; Axalitin; Kofarest; Mucaryl-AX; Novamox AX; Roxelipin-ME; Supriven-AX; **Mex.:** Acimox-AX; Aeroflux; Alerfin Ex; Alexing; Ambrodi-C; Aminofedrisin; Balsibron-C; Biovacin Ex; Biscin-ol; Bolbamox; Brogal Compositum; Brogal-T; Brogram; Brominol-C; Bronar; Bronolan-M; Broquiol; Brosolan C; Broxofar Compuesto; Broxol Air; Broxol Plus; Broxolim-AM; Broxolim-C; Brumax; Cefabronol; Cibronal; Cobadex; Coricidin Expec; Dexol; Dextoltrin; Dofaxil; Doralan-AX; Ebromin P; Epical NF; Fanbrox; Fleamex; Fludexol-CL; Fluvicil; Fluxibit; Fluxol; Futac; Gimabrol; Histical NF; Laritol Ex; Linfardex; Loexom FC; Loexom FS; Loxorol; Mucoflux; Mucosolvan Compositum; Mucovibrol Amoxi; Mucovibrol C; Musaldox; Neumyn-AS; Pentibroxil; Plexus; Ravotaf; Removil; Rezipen; Rombox; Salamlux; Sekretovit Amoxi; Sekretovit Ex; Sensibit XP; Septacin Amoxi; Septacin Ex; Seraxol; Serbol; Sermaxol; Siblex; Solibrol; Tadinac-C; Tavexil; TheraFlu Tenalif; Torva; Toxol; Ula-X; Vamnoxol; **Port.:** Clembroxol; Lactucol; Mucospas; Ventolitol; **Rus.:** Col-dact Broncho (Колдакт Бронхо); Rinicold-Broncho (Риниколд Бронхо); **Venez.:** Aeroflux; Ambroclax; Ambromuco Compositum; Arbiel; Clenbuxol; Lituxix Compositum; Mucolin; Mucosolvan Compositum.

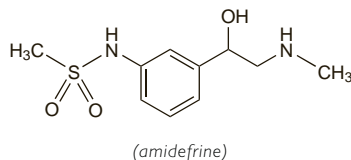
Amidefrine Mesilate (BAN, INN) ⊗

5190; Amidéfrine, Mésilate d'; Amidefrini Mesilas; Amidephrine Meslyate (USAN); Mesilato de amidefrina; MJ-5190. 3-(1-Hydroxy-2-methylaminoethyl)methanesulphonanilide methanesulphonate.

АМИДЕФРИНА Мезилат

$C_{10}H_{16}N_2O_3S \cdot CH_4O_3S = 340.4$.

CAS — 3354-67-4 (amidefrine); 1421-68-7 (amidefrine mesilate).



Profile

Amidefrine mesilate is a sympathomimetic with alpha-adrenergic activity similar to that of phenylephrine (p.1568). It is used for its vasoconstrictor properties in the local treatment of nasal congestion.

Preparations

Proprietary Preparations (details are given in Part 3)

Austria: Fentrinol.

Ammonium Acetate

Amonio, acetato de; Amonowy octan.

Ацетат Аммония; Уксуснокислый Аммоний

$CH_3CO_2NH_4 = 77.08$.

CAS — 631-61-8 (ammonium acetate); 8013-61-4 (ammonium acetate solution).

Pharmacopoeias. *Br.* includes Strong Ammonium Acetate Solution.

Ammonium Bicarbonate (BAN)

Ammonii hydrogenocarbonas; Ammonium, bicarbonate d'; Ammonium-hydrogen-karbonát; Ammoniumvätekarbonat; Ammoniumvetykarbonaatti; Amonio, bicarbonato de; Amonio-vandelilio karbonatas; E503; Hydrogenuhlitan amonny. Ammonium hydrogen carbonate.

Бикарбонат Аммония; Гидрокарбонат Аммония; Двууглекислый Аммоний
 $NH_4HCO_3 = 79.06$.
CAS — 1066-33-7.

Pharmacopoeias. In *Eur.* (see p.vii).

Ph. Eur. 6.2 (Ammonium Hydrogen Carbonate; Ammonium Bicarbonate BP 2008). A fine, white or almost white, slightly hygroscopic, crystalline powder or white or almost white crystals. It volatilises rapidly at 60°; volatilisation takes place slowly at ambient temperatures if slightly moist. It is in a state of equilibrium with ammonium carbamate. Freely soluble in water; practically insoluble in alcohol. Store in airtight containers.

The BP 2008 directs that when Ammonium Carbonate is prescribed or demanded Ammonium Bicarbonate shall be dispensed or supplied.

Ammonium Carbonate

Amonio, carbonato de; Amonowy węglan; Carbonato de Amonio; E503.

Карбонат Аммония; Углекислый Аммоний

CAS — 8000-73-5.

Pharmacopoeias. In *Fr.* Also in *USNF*.

USNF 26 (Ammonium Carbonate). A white powder, or hard, white or translucent masses having a strong odour of ammonia, without empyreuma. It consists of ammonium bicarbonate and ammonium carbamate, in varying proportions. It yields 30 to 34% of NH_3 . On exposure to air it loses ammonia and carbon dioxide, becoming opaque, and is finally converted into friable porous lumps or a white powder of ammonium bicarbonate. Soluble 1 in 4 of water. It is decomposed by hot water. Its solutions are alkaline to litmus. Store in airtight containers at a temperature not exceeding 30°. Protect from light.

NOTE. The BP 2008 directs that Ammonium Bicarbonate shall be dispensed or supplied when Ammonium Carbonate is prescribed or demanded.

Ammonium Chloride

510; Ammonii chloridum; Ammonium Chloratum; Ammonium, chlorure d'; Ammoniumklorid; Ammonium-klorid; Ammoniumkloridi; Amonio chloridas; Amonio, cloruro de; Amonowy chlorrek; Chlorid amonny; Cloruro de Amonio; Muriate of Ammonia; Sal Ammoniac.

Хлорид Аммония; Хлористый Аммоний

$NH_4Cl = 53.49$.

CAS — 12125-02-9.

ATC — B05XA04; G04BA01.

ATC Vet — QB05XA04; QG04BA01.

Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), *US*, and *Viet*.

Ph. Eur. 6.2 (Ammonium Chloride). A white or almost white, crystalline powder or colourless crystals. Freely soluble in water. **USP 31** (Ammonium Chloride). Colourless crystals or white, fine or coarse, crystalline powder. Is somewhat hygroscopic. Freely soluble in water and in glycerol, and even more so in boiling water; sparingly soluble in alcohol. pH of a 5% solution in water is between 4.6 and 6.0. Store in airtight containers.

Adverse Effects and Treatment

Ammonium salts are irritant to the gastric mucosa and may produce nausea and vomiting particularly in large doses. Large doses of ammonium chloride may cause a profound acidosis and hypokalaemia which should be treated symptomatically. Intravenous ammonium chloride can cause pain and irritation at the site of injection, which may be decreased by slowing the rate of infusion.

Excessive doses of ammonium salts, particularly if given by rapid intravenous injection, may give rise to hepatic encephalopathy due to the inability of the liver to convert the increased load of ammonium ions to urea.

Precautions

Ammonium salts are contra-indicated in patients with hepatic or renal impairment.

Pharmacokinetics

Ammonium chloride is absorbed from the gastrointestinal tract. The ammonium ion is converted into urea in the liver; the anion thus liberated into the blood and extracellular fluid causes a metabolic acidosis and decreases the pH of the urine; this is followed by transient diuresis.

Uses and Administration

Ammonium chloride is used as an expectorant in productive cough (p.1547). Other ammonium salts that have been used similarly include the acetate, bicarbonate, camphorate, carbonate, citrate (p.2256), and glycyrrhizate (p.2316).